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Memorandum

LANSCE-3

Neutron and Nuclear Science

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Subject: Results for Hydrogen and Helium Production in Neutron Reactions on Iron

Here are results of hydrogen and helium production cross sections for neutron interactions on iron with neutron energies up to 120 MeV. The error bars have an estimated systematic error that is significant. The statistical uncertainty is much less.

Table 1. Hydrogen Production Cross Sections For Iron

- Includes protons, deuterons, and tritons.
- Normalized to 190 mb at 14 MeV.
- See Figure 1.

En(MeV)	Sig (mb)	Dsig (mb) ($\pm 15\%$)
8	74.8	11.2
9	106.0	15.9
10	108.9	16.3
12	120.2	18.0
14	190.0	28.5
16	257.0	38.5
18	298.1	44.7
20	325.2	48.8
25	385.0	57.8
30	465.9	69.9
35	530.5	79.6
40	564.3	84.7
50	649.2	97.4
60	691.5	103.7
70	666.7	100.0
80	721.8	108.3
90	754.2	113.1
100	701.9	105.3
120	700.7	105.1

Table 2. Helium Production Cross Sections For Iron

- Includes ^3He and ^4He .
- Normalized to 40 mb at 14 MeV.
- See Figure 2.

En(MeV)	Sig(mb)	Dsig(mb) ($\pm 15\%$)
8	7.4	1.1
9	21.1	3.2
10	27.1	4.1
12	35.2	5.3
14	40.0	6.0
16	53.5	8.0
18	65.8	9.9
20	79.9	12.0
25	110.6	16.6
30	123.4	18.5
35	140.2	21.0
40	144.9	21.7
50	151.5	22.7
60	156.9	23.5
70	165.2	24.8
80	153.7	23.1
90	162.6	24.4
100	161.9	24.3
120	159.5	23.9

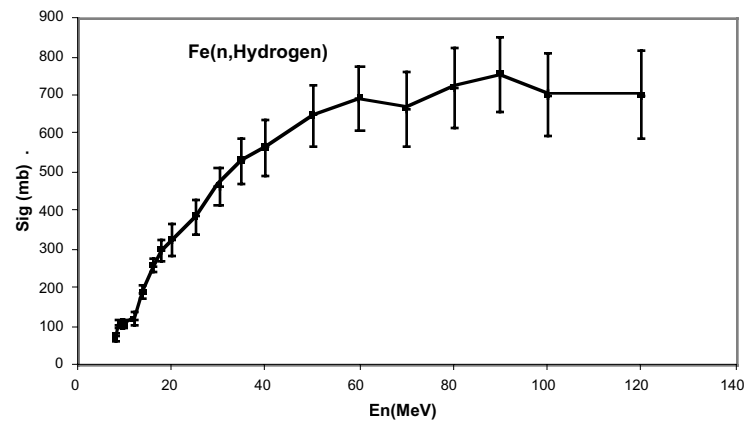


Figure 1. Results of hydrogen production by neutrons on elemental iron. Hydrogen production is the sum of proton, deuteron and triton production. The 15% systematic uncertainty is the major uncertainty. Relative cross sections at neighboring energies have a much smaller uncertainty, estimated at 5%. The points are the central points of bins, the width of which is the spacing between neighboring points.

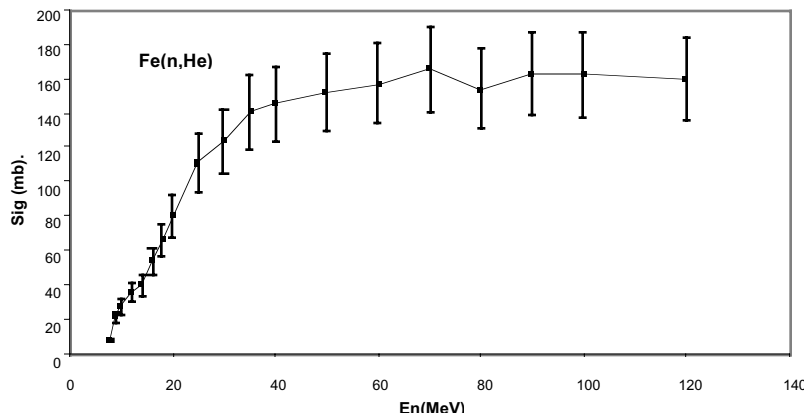


Figure 2. Results of helium production by neutrons on elemental iron. Helium production is the sum of ^3He and ^4He production. The 15% systematic uncertainty is the major uncertainty. Relative cross sections at neighboring energies have a much smaller uncertainty, estimated at 5%. The points are the central points of bins, the width of which is the spacing between neighboring points.

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